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GRAPHIC SURVEY OF THE LIME INDUSTRY, 1910-38

CHANGES IN THE NUMBER OF COMPANIES, PLANTS, AND KILNS, AND IN THEIR OUTPUT AND CAPACITY

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BY

OLIVER BOWLES AND A. T. COONS

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UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

GRAPHIC SURVEY OF THE LIME INDUSTRY, 1910-38

Changes in the Number of Companies, Plants, and Kilns, and in Their Output and Capacity[1]

By Oliver Bowles[2] and A. T. Coons[3]

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INTRODUCTION

During the last three decades the lime industry has undergone remarkable anges affecting the number of plants, companies, and kilns, as well as eir output and capacity. In 1910, 1,073 firms produced more than 3,400,000 ns of lime. Shortly after the close of the World War (1919) the number of rms had dropped to 490, although production had declined very little. In 25, the banner year, when output totaled nearly 4,600,000 tons, the number companies had fallen to 399. At the low point of the depression (1932), companies produced about 1,960,000 tons; in 1937, although production had sen to over 4,100,000 tons, the number of companies had declined to 278; d in 1938, with a decline in production to about 3,450,000 tons, the pro-cing companies numbered 284. Thus, except for minor fluctuations, the mber of operating firms has dropped steadily, irrespective of business nditions. Conversely, the annual output per company has increased. In 10 it was 3,199 tons; in 1938, 11,785 tons.

The following table shows the development of the principal trends at ecified intervals during the period under review:

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[1] The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from Bureau of Mines Information Circular 7088."

[2] Assistant chief engineer, Nonmetal Economics Division, Bureau of Mines.

[3] Building Materials Unit, Nonmetal Economics Division, Bureau of Mines.

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Output and capacity at intervals from 1910 to 1938

Year	Number of companies	Average production (tons per year) per —			Average kiln capacity (tons per day)
		Company	Plant	Active kiln	
1910	1,073	3,199	3,016	---	---
1915	852	4,252	3,999	---	---
1920	471	7,580	6,932	2,035	10.2
1925	399	11,480	10,180	2,488	10.5
1930	336	10,083	9,034	2,531	13.2
1935	267	11,188	9,891	3,089	14.1
1936	263	14,256	12,374	3,318	13.7
1937	278	14,835	13,134	3,624	14.3
1938	284	11,785	10,427	3,079	14.6

COMPANIES GROUPED ACCORDING TO SIZE

Statistical data of the lime industry available in the Bureau of Mines make it possible to segregate companies into certain groups according to output and to trace the history of each group in a general way for a period of years. Figure 1 shows production of lime by companies of various size groups from 1910 to 1938. The number of companies in each group each year is indicated by the superimposed figures. From 1916 there has been included in the output a production of dead-burned dolomite comprising 4 to 17 percent of the total. If dead-burned dolomite is excluded, the general trends are virtually unchanged.

As indicated in figure 1, production by small concerns (those producing less than 1,000 tons a year) is an insignificant part of the total and is gradually becoming smaller. The number of such companies has dropped from 701 in 1910 to only 98 in 1938. Many of the plants in this group are of the intermittent local type operated by farmers for making agricultural lime. Gradually these local kilns have been abandoned, and farmers have purchased their requirements from commercial lime companies to an increasing extent.

The second group, those producing 1,000 to 5,000 tons a year, represent more substantial production than the first group, but these concerns also ar to be classed as local producers. Total output of this group shows a gradua reduction, and the number of companies has dropped from 218 in 1910 to 77 in 1938.

The third group, those producing 5,000 to 10,000 tons a year, serves more than local territory. It is about equal in total production with group 2 and shows the same trend, the number of companies having decreased from 78 to 30 in the period. For these three groups the number of producers has declined from 997 to 205 and the aggregate output from 1,225,000 tons to a little over 421,000 tons. In 1910 the total of these three groups comprised about 93 percent of the firms and 36 percent of the production; in 1938 they represented 72 percent of the companies but only 13 percent of the total output.

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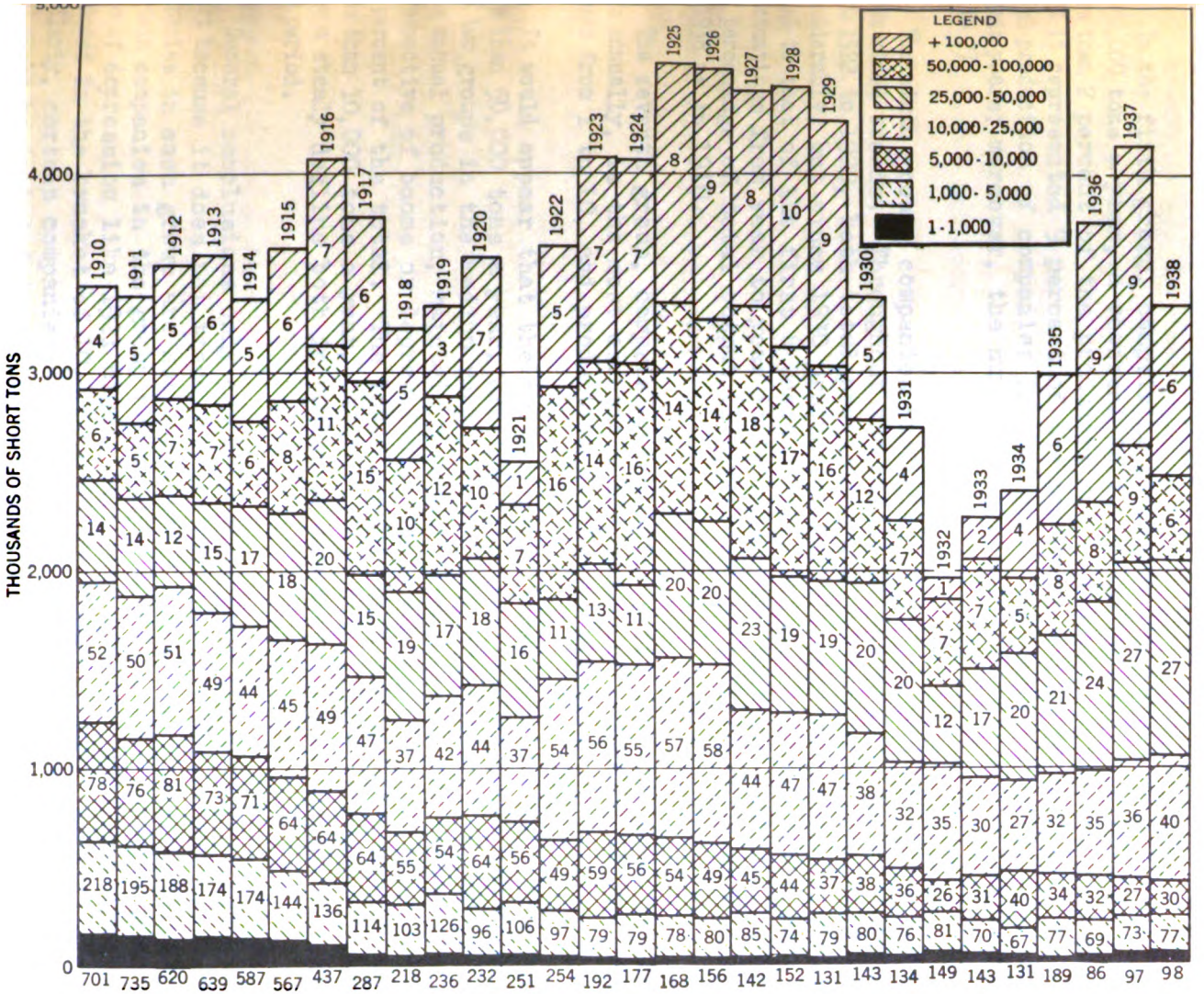

Figure 1.- Production of lime (including dead-burned dolomite) in the United States, 1910-38, by companies grouped according to size (number of tons of lime produced annually). The number of companies in each group is indicated by the superimposed figures.

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The fourth group, companies producing 10,000 to 25,000 tons per year, as a total production somewhat greater than the total of the first three roups. Its output has been sustained better than that of the lower groups, d the decrease in the number of companies is less marked, having fallen om 52 to 40 in the 29 years under discussion. In 1938 this group, repre- nting 14 percent of the companies, produced 19 percent of the total output.

In the fifth group, comprising companies ranging in output from 25,000 50,000 tons a year, a reversal in the trend appears. In 1910 it included ss than 2 percent of the producers and 15 percent of the total output; in 38 it represented 9 percent of the producers and 29 percent of the output. tal production of companies in this group has increased strikingly during cent years; moreover, the number of companies operating has increased from to 27.

The sixth group, companies producing 50,000 to 100,000 tons a year, ows mixed trends. Throughout the middle of the period, in the active years om 1922 to 1929, both total production and the number of companies increased nsiderably, but since 1930 production has scarcely maintained a volume ual to that of the first 6 years of the period. Although there have been ctuations from year to year it is noteworthy that the number of plants (6) d percentage of total output (13) represented by this group were the same 1938 as in 1910.

The seventh group, comprising companies producing more than 100,000 ns annually, is the most erratic. The number of companies in the group nges from 1 to 10, and production fluctuates greatly.

It would appear that the two groups of largest companies, those producing re than 50,000 tons a year, are the most sensitive to booms and depressions. e two groups in the medium range, comprising companies of 10,000 to 50,000 ns annual production, maintain a comparatively steady and stable production respective of booms or depressions. Their aggregate output averages about percent of the total. The lower groups which include companies producing ss than 10,000 tons a year, maintain fair stability from year to year but ow a steady decline both in number of companies and in output throughout e period.

General conclusions only can be reached from the data presented in this art because it does not trace the history of individual companies. The mpanies in each group are not necessarily identical from year to year. rtain companies in the group producing 5,000 to 10,000 tons per year at a me of depression like 1921 might, in a year of great activity like 1925, be cluded in the bracket of 10,000 to 25,000 tons per year, or even higher. milarly, certain companies of the 1,000 to 5,000 tons per year group in 21 might be included in the 5,000- to 10,000-ton group in 1925. The migra- on of a company from one group to another, however, may be independent of siness cycles. Its movement to a higher bracket may be due to the erection new kilns or to consolidation of two or more companies into one. Con- rsely, it may migrate to a lower group because of abandonment of obso- scent kilns or to loss of markets to competing companies.

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Figure 2 illustrates this migration of companies from one group to another because of changing circumstances. The history of output of five unnamed companies, designated A, B, C, D, and E, is traced from 1927 to 1938.

Company A, which was in the 100,000-ton bracket in 1927, showed increased activity in 1928, declined rapidly in 1929, and fell into the 50,000- to 100,000-ton group from 1932 to 1935. It began a remarkable recovery, however, in 1934 and for the last 3 years has been again in the highest bracket.

Company B started in the 50,000- to 100,000-ton group in 1937, and although it experienced the general decline of the depression years it recovered steadily after 1932 and reached and has retained its position in the highest group since 1935. Both company A and company B have succeeded in reaching a higher production peak than before the depression.

Company C has a different record. Starting in the 25,000- to 50,000-ton group in 1927 and falling into the next lower group in 1928, it regained its original position in 1929, only to fall back again into the lower group, where it remained fairly stationary throughout the depression but rose sharply in 1935 to the 50,000- to 100,000-ton group. In 1936 and 1937 it was in the highest group but declined one step in 1938. Company C, therefore, was in four different groups during the 12-year period. The record of this company obviously illustrates the influence of local conditions such as modernization or enlargement of plant or consolidation of companies.

Company D declined so greatly in production after 1929 that in 1932 it was two groups lower than in 1927, and its recovery has been so hesitant that in 1938 it was still one group lower than in 1927. Since 1927, company E has been grouped in each of the four lower brackets. After an encouraging pickup in 1937, it declined in 1938 to the same group as in 1927, and with a lower output. Because of this migration, which is typical of many companies, those that fall in a given group in one year may be quite different from those appearing in the same group during another year.

TOTAL PRODUCTION, BY GROUPS

The accompanying table shows total production of each group for selected years. It is evident that the smaller concerns are gradually abandoning their plants or are being absorbed by the larger companies.

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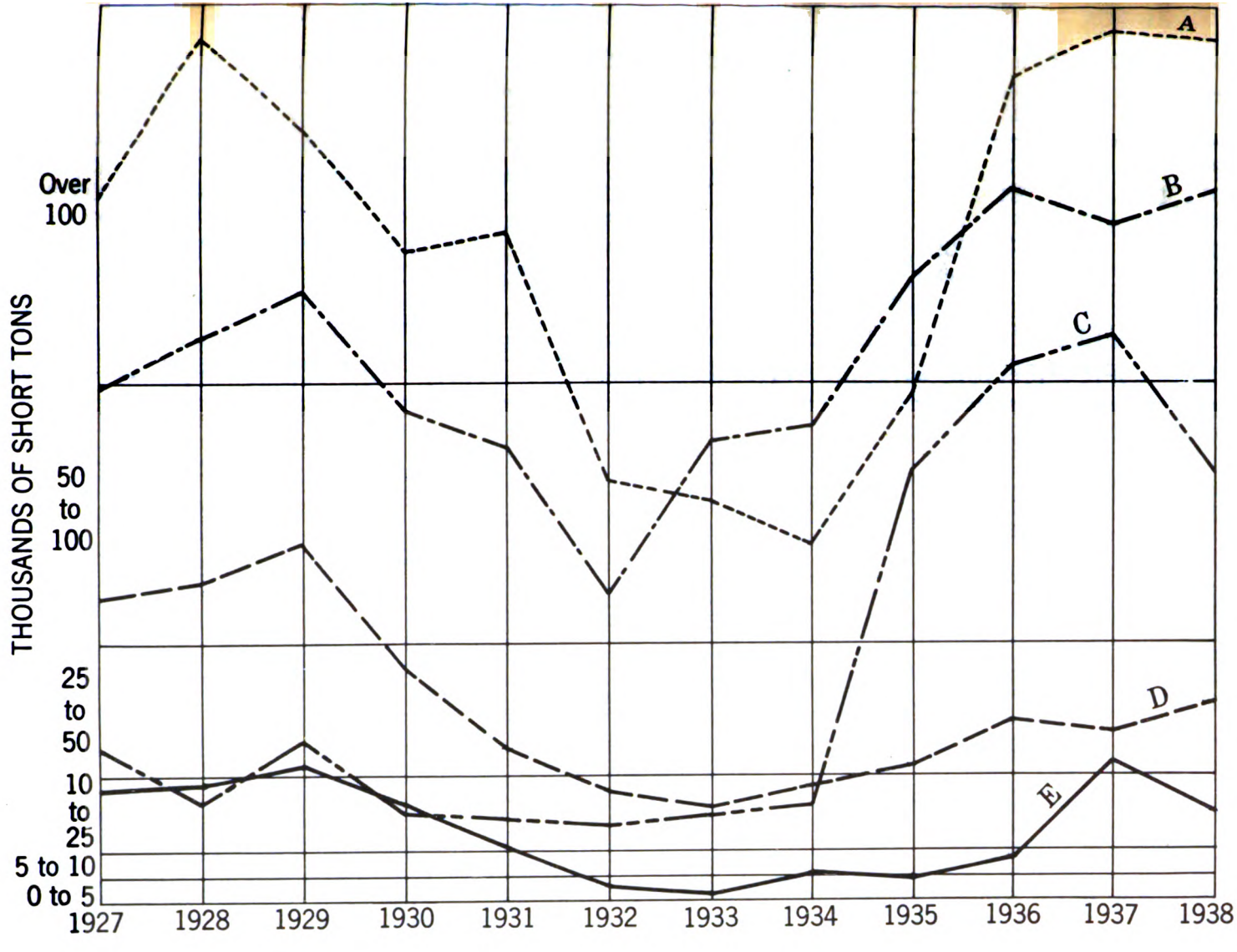

Figure 2.--Production of five selected companies in tons per year, 1927-38, showing migration from one group to another.

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Production of lime by operators in different ranges of output, for selected years

Tons per year	1910	1915	1920	1925	1930	1935	1936	1937	1938
Less than 1,000..	176,106	132,816	51,020	39,031	37,110	22,162	24,414	27,745	27,928
1,000 to 5,000...	470,787	348,907	248,374	213,518	210,198	195,910	181,385	201,170	179,875
5,000 to 10,000..	577,982	475,099	448,071	395,429	279,385	242,011	239,137	197,872	213,831
10,000 to 25,000.	728,573	691,096	666,012	909,904	648,764	493,020	541,610	595,750	633,847
25,000 to 50,000.	517,411	644,714	637,954	715,906	747,105	700,684	839,491	988,013	963,041
50,000 to 100,000	432,512	567,895	676,133	1,073,406	833,732	562,980	504,531	608,931	456,525
Over 100,000.....	528,583	762,283	842,577	1,233,629	631,586	770,366	1,418,816	1,504,684	871,907
Total.....	3,431,954	3,622,810	3,570,141	4,580,823	3,387,880	2,987,133	3,749,483	4,124,165	3,346,954

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TRENDS IN MULTIPLE-PLANT COMPANIES

Figure 1 is based on company operations rather than on individual plants. Quite a number of lime producers, particularly those of large output, operate two or more plants. Bureau of Mines data make it possible to follow the trends in multiple-plant companies. Figure 3,A, represents the total number of active plants producing more than 1,000 tons a year during each year from 1910 to 1938, and figure 3,B, represents the total number of active companies producing more than 1,000 tons a year. Both the number of companies and number of plants have decreased steadily with minor fluctuations. The gradual convergence of the lines indicates that the number of multiple-plant companies is decreasing or that multiple-plant companies individually are operating fewer plants. In 1911 there were 1.2 plants per company, in 1938, 1.1. The decrease in the number of companies is brought about in two ways, first by cessation of activity, and second by consolidation of two or more companies into one. Many consolidations of companies have taken place during this period, and such consolidations are commonly accompanied by abandonment of plants. In many instances, plants acquired by companies have been abandoned within a short time after the change in ownership.

Comparing the curves on this chart with those of capacity (fig. 4), it is evident that, although the number of plants has decreased greatly, plant capacity has increased. Individual concerns on the average were capable of producing much more lime in 1938 than the average company of 1917. This is due partly to the construction of larger kilns and partly to improved efficiency, which has brought about a substantial increase in output of kilns

Figure 3,C, represents the number of operators producing less than 1,000 tons a year. There are virtually no multiple-plant companies in this group, but the curve is added to emphasize the striking decline in number of small operations.

VARIATIONS IN PLANT CAPACITY FROM YEAR TO YEAR

Plant capacity is a somewhat uncertain quantity because the capability to produce depends on skill and management as well as on plant equipment. The figures on capacity used herein are those reported to the Bureau by the individual companies. Although the basis of appraisal may vary somewhat between companies, in the aggregate the differences tend to compensate each other, and the totals from year to year are reasonably comparable.

Figure 4,A, shows the total capacity in tons per day of all active lime plants from 1917 to 1938, and figure 4,B, shows the total daily capacity of active plants producing 1,000 tons or more per year for the same period. The total daily capacity of plants producing less than 1,000 tons a year is therefore represented by the space between curves A and B. It may be observed that the total capacity of small plants has diminished gradually except for the period 1932 to 1934. The reason for this reversal in trend is covered in the discussion of figure 6. The general decrease in capacity of small plants is a natural result of the marked drop in the number of such plants as indicated in figure 1.

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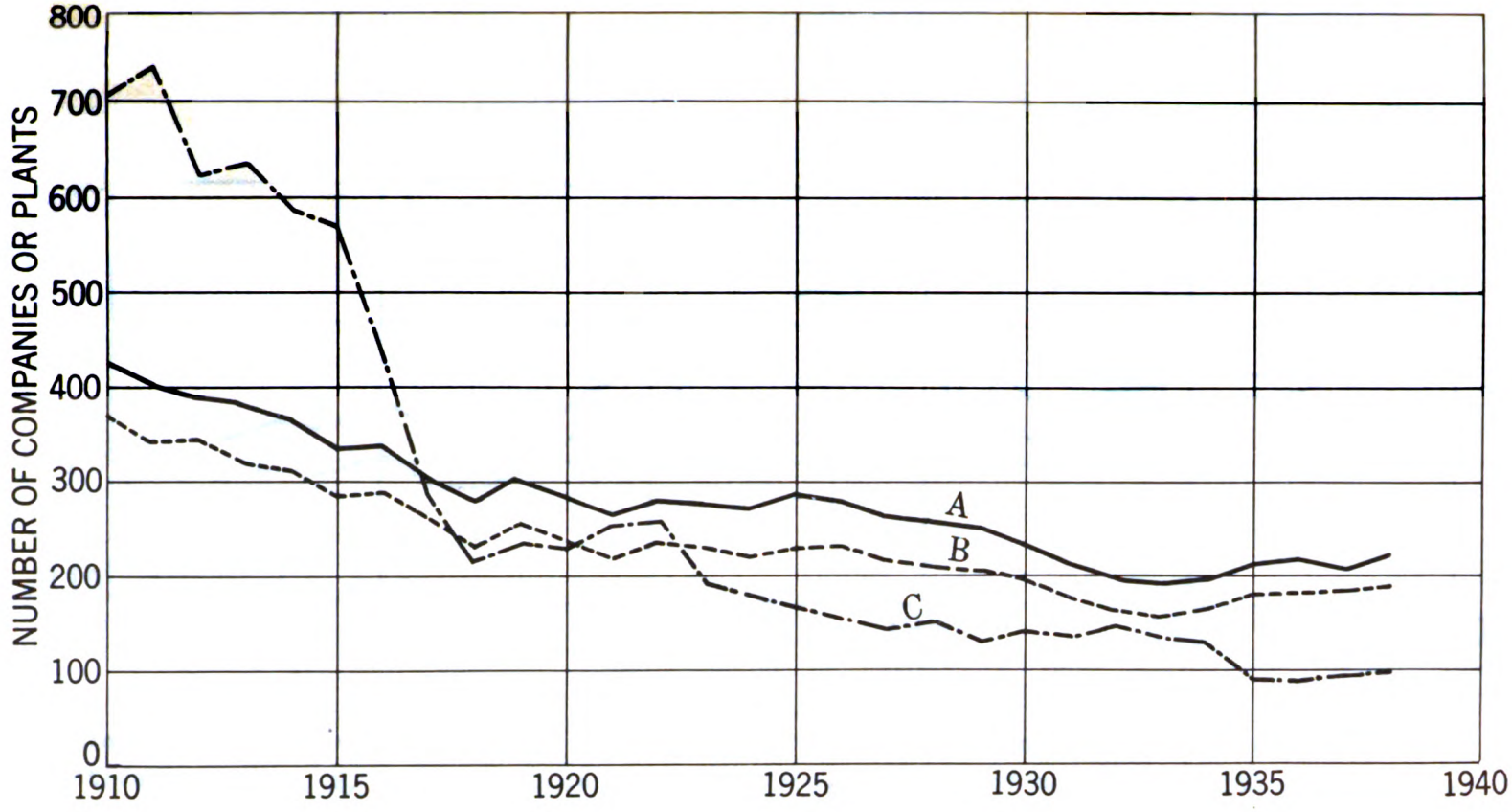

Figure 3.--Trends in number of plants and companies.

A. Number of active plants in companies producing more than 1,000 tons a year.
B. Number of active companies producing more than 1,000 tons a year.
C. Number of active operators producing less than 1,000 tons a year.

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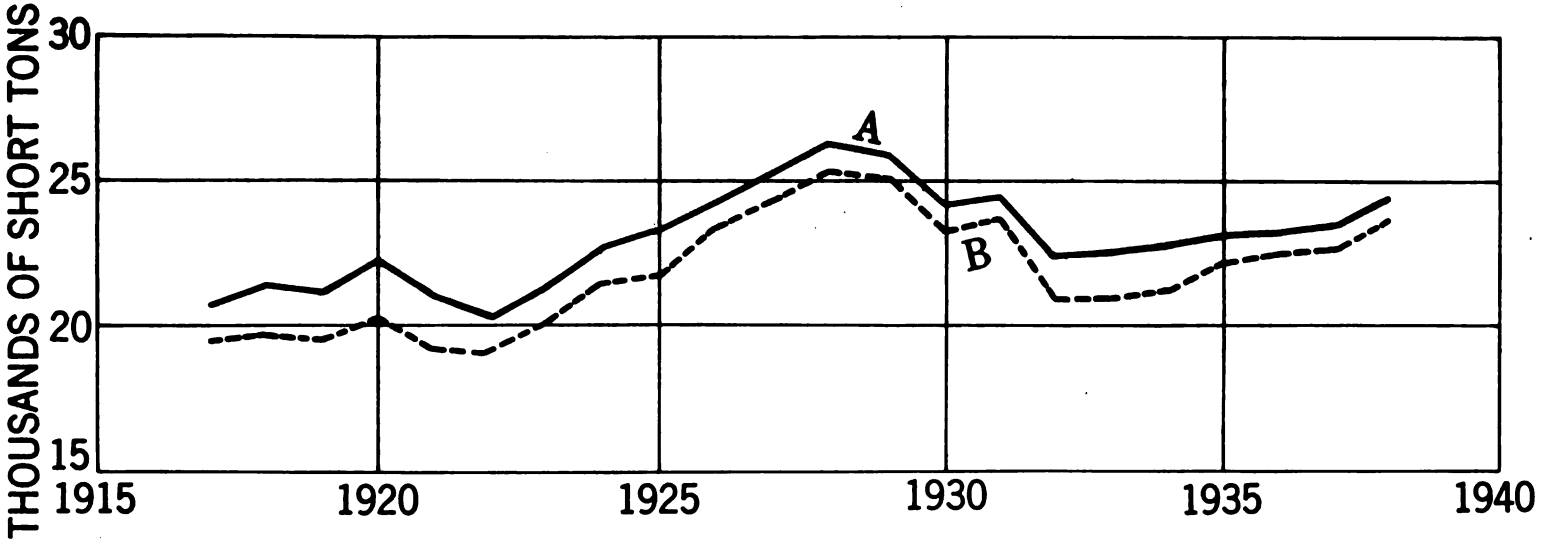

Figure 4.- Total capacity of active lime-producing companies in tons per day, 1917-38: A, All active companies; B, active producers with individual output of more than 1,000 tons per year.

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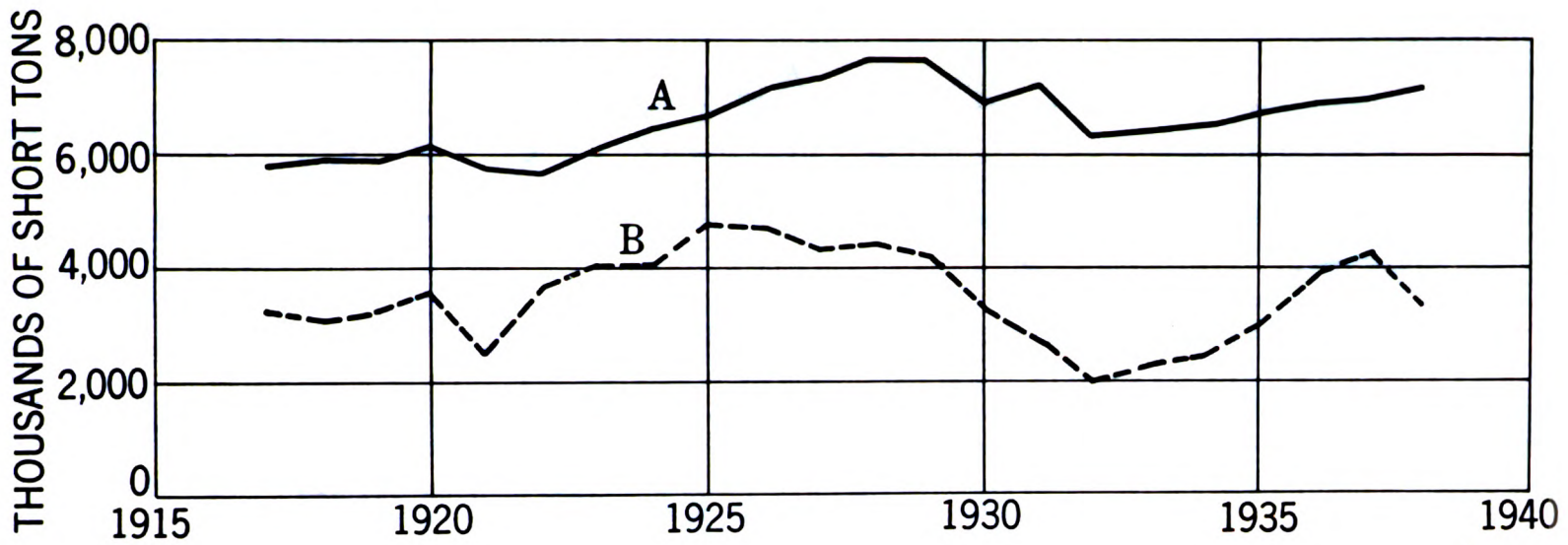

Figure 5.- Output compared with capacity; A, approximate annual capacity of companies producing more than 1,000 tons a year; B, annual output of companies producing more than 1,000 tons a year.

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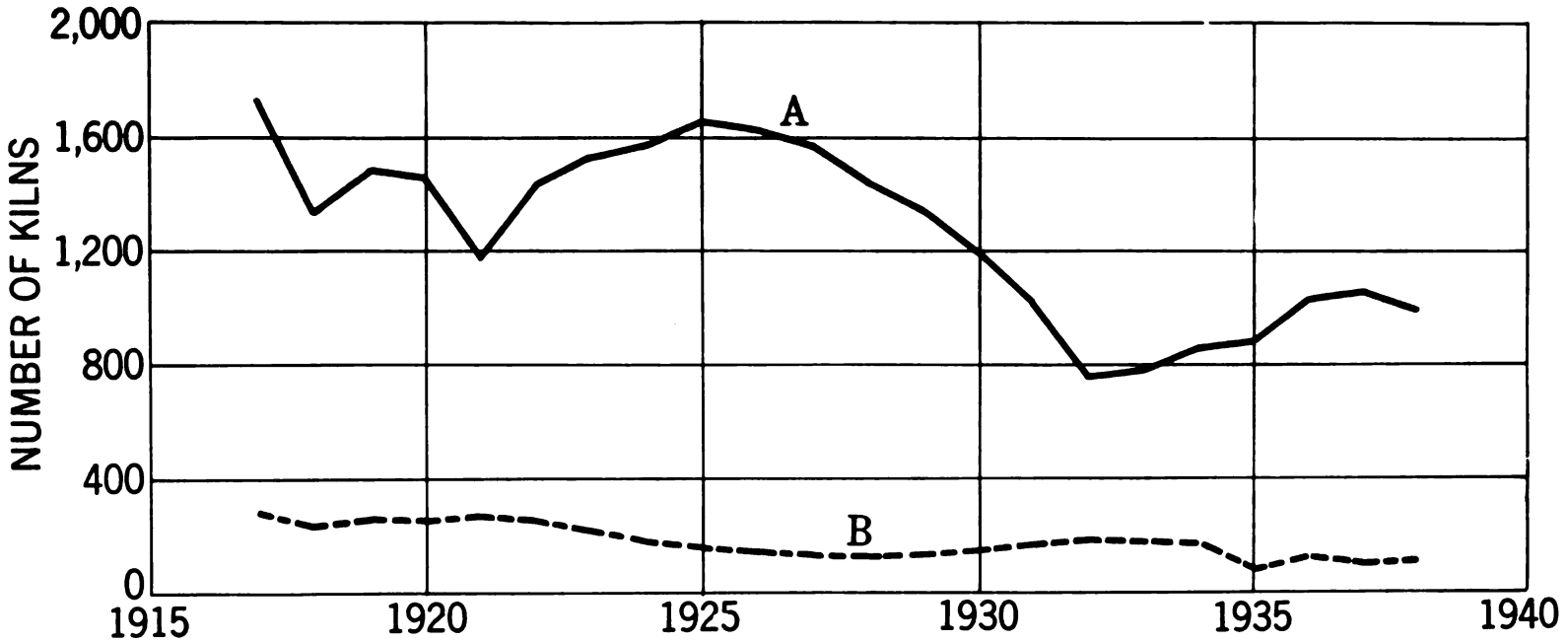

Figure 6.- Number of active kilns in lime plants, 1917-38; A, active kilns of companies producing more than 1,000 tons a year; B, active kilns of companies producing less than 1,000 tons a year.

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The capacity of active plants exceeding 1,000 tons a year reached a ximum in 1928, dropped to a low point in 1934, but recovered substantially the 4 years following.

RATIO OF PRODUCTION TO CAPACITY

Figure 5 shows production and approximate plant capacity for each year om 1917 to 1938. The capacity shown herein is not the total capacity of l plants whether idle or active. Idle plants have been excluded because e capacity to produce of inactive plants becomes a very doubtful and un- rtain factor as the years of inactivity increase. The capacity as here presented is that of companies reporting production and is confined to mpanies producing over 1,000 tons a year. Those producing less than 1,000 ns a year constitute, as pointed out previously, a very small part of the tal. The figure reported is average daily capacity, and the annual figure s been derived by assuming that plants operate an average of 300 days a ar. Capacity is, therefore, an approximation only, while production is a finite dependable figure.

Total production for the 22-year period was about 51 percent of the tal capacity of active companies. During the lean years from 1929 to 1935 e gap between capacity and output widened considerably, but there was a rked gain in output compared with capacity during 1936 and 1937. In 1937 oduction was about 60 percent of estimated capacity; in 1938, owing to cline in production and a small increase in the number of operators, it opped to about 47 percent.

VARIATIONS IN NUMBER OF ACTIVE KILNS

Another interesting phase of the history of lime burning is the changes at have occurred in the number of kilns. Figure 6,A, shows the total mber of active kilns of companies producing 1,000 tons or more per year, d curve B shows the total number of active kilns of companies producing ss than 1,000 tons a year. The general trend for both large and small mpanies is toward a reduction in the number of kilns. The fluctuations om year to year are greater for the larger companies than for the smaller es. For the larger companies there was a decided recovery in the downward end from 1922 to 1925, and in 1936 another marked gain from the low point the depression. Although the number of active kilns was much larger in 17 than in 1938, production during the latter year was considerably higher an in 1917. The average annual output per kiln increased from 2,399 tons 1920 to 3,624 tons in 1937 and 3,079 tons in 1938. This reflects the rger size and greater efficiency of kilns.

It is interesting to note that although the number of active kilns of the rger companies fell to the lowest point in many years during the period 32 to 1934, the number of kilns operated by smaller plants actually in- eased at that time. Many of these small plants are intermittent field lns operated by farmers. They have their own fuel (wood or coal) and burn me for use on their own or on local farms. When money is available, these rmers buy lime from the commercial producers, but when their buying power

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is at a low level and labor is plentiful they burn lime in their own kilns. This probably accounts largely for the increase in the number of small plants in operation from 1932 to 1935 and also for the increase in plant capacity of small active plants during the same period, as indicated in figure 4. However another factor tending to swell the number of plants in this group in the depression years is accession of plants formerly in a higher bracket that fell to this group because of drastic decline in production.

OUTSTANDING FEATURES

Some significant trends in the lime industry illustrated by these charts are:

1. Companies of under 1,000 tons a year production constitute a relatively insignificant part of the industry, and the output of this group is gradually becoming smaller.

2. Companies in the medium range of 10,000 to 50,000 tons annual production show the least fluctuation in total output from year to year, while the groups of larger companies, producing 50,000 tons or more a year, are the most sensitive to booms and depressions.

3. Although there have been many consolidations of companies, the ratio of number of plants to number of companies is declining.

4. The number of active kilns has decreased greatly, but kiln capacity has increased.

5. Production from 1917 to 1938 averaged about 51 percent of the approximate capacity of active companies.

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